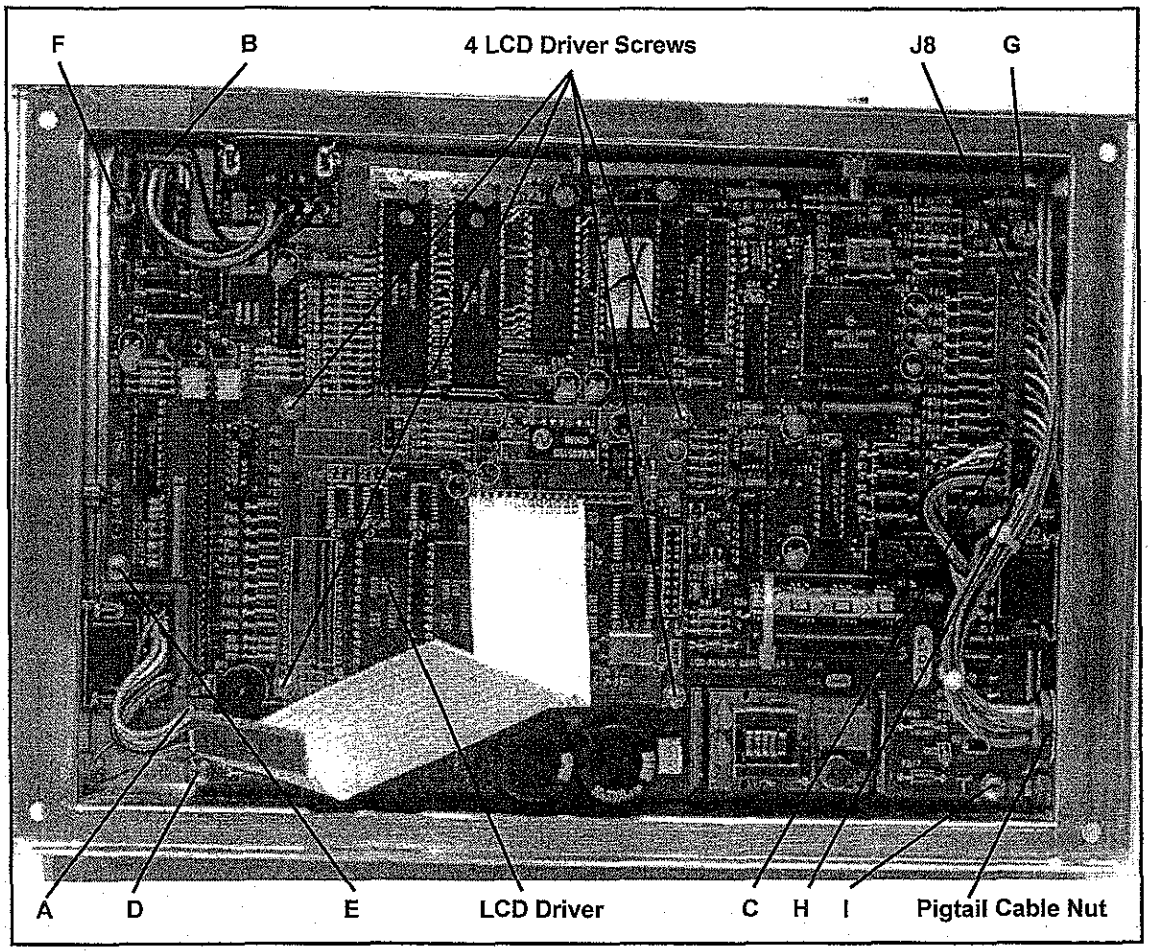

Figure 4-5a: Remote's Bottom Enclosure (with LCD Driver)

4.3.5 Replacing Remote's Speaker

Refer to Figures 4-5a and 4-5b.

4.3.5.1 Required Tools

- 5/16" nut driver

4.3.5.2 Removal Procedure

1. Follow the procedure for separating the Remote's top and bottom enclosures (Section 4.3.1.2).
2. Follow the procedure for removing the Remote's main PCB (Section 4.3.3.2).
3. Use the 5/16" nut driver to remove the four (4) hex nuts securing the speaker to the back of the bottom enclosure. Remove and save the locking washers and flat washers. Note the orientation and wire direction.

4.3.5.3 Replacement Procedure

1. Insert the speaker inside the Remote's bottom enclosure in the proper orientation.
2. Insert the flat washers, locking washers, and screws into the four corners of the speaker. Tighten using the 5/16" nut driver.
3. Follow the procedure for replacing the Remote's main PCB (Section 4.3.3.3).
4. Follow the procedure for closing the Remote's top and bottom enclosures (Section 4.3.1.3).

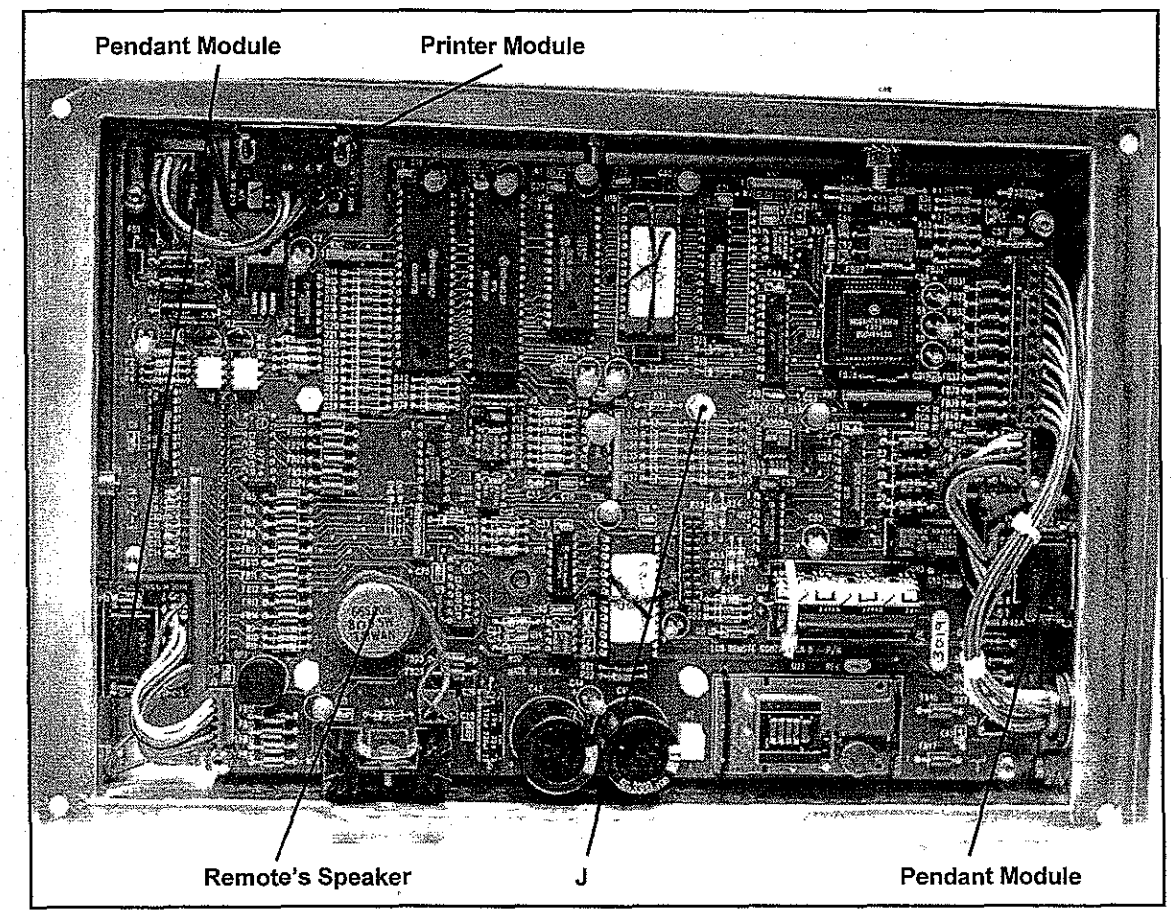

Figure 4-5b: Remote's Bottom Enclosure (without LCD Driver)

4.3.6 Replacing Remote's Pendant Modules or Printer Module

Note: Some Pendant and Printer Modules are manufactured with brackets that have tapped holes and are secured to the enclosure with screws. Others have through-holes and are secured with a screws, nuts, and locking washers.

4.3.6.1 Required Tools

- 1/16" balldriver or Allen wrench
- 5/64" balldriver or Allen wrench
- 1/4" open end wrench

4.3.6.2 Removal Procedure

1. Follow the procedure for separating the Remote's top and bottom enclosures (Section 4.3.1.2).
2. Select the module to be replaced.
3. Disconnect the plug connector from the main PCB.
4. Remove the module's ground wire from the main PCB. Use the 5/64" balldriver to remove the appropriate ground screw. Remove and save the locking washer.
5. If the module is secured to the Remote's bottom enclosure with screws only (see the above note), remove the two screws using the 1/16" balldriver. If the module is secured with screws and nuts, hold each inside nut with the 1/4" open end wrench while removing the screw using the 1/16" balldriver. Remove and save the locking washers.
6. Remove the module.

4.3.6.3 Replacement Procedure

1. Insert the module inside the Remote's bottom enclosure.
2. If the module has brackets with tapped holes, secure to the Remote's enclosure with two screws using the 1/16" balldriver. If the module has through-holes, secure using the two screws, nuts, and locking washers. Hold the nut on the inside with the 1/4" open end wrench while tightening the screw with the 1/16" balldriver (see the above note).
3. Connect the module's ground wire to the ground screw and tighten with the 5/64" balldriver. Make certain to insert the locking washer.
4. Connect the plug connector to the plug receptacle on the main PCB.
5. Follow the procedure for closing the Remote's top and bottom enclosures (Section 4.3.1.3).

4.3.7 Replacing Remote's Pigtail Cable

Refer to Figure 4-6.

4.3.7.1 Required Tools

- Two adjustable wrenches
- 3/4" open end wrench or adjustable wrench
- 5/64" balldriver or Allen wrench

4.3.7.2 Removal Procedure

1. Follow the procedure for separating the Remote's top and bottom enclosures (Section 4.3.1.2).
2. Follow the procedure for removing the Remote's main PCB (Section 4.3.3.2).
3. If you haven't already done so, disconnect the Pigtail Cable's wires from J8 on the PCB.
4. Use the 3/4" open end wrench or adjustable wrench to loosen the nut and washer inside the remote securing the Pigtail Cable. Use caution so as not to damage PCB.
5. Finish unscrewing the nut by hand and remove the Pigtail Cable and adapter (see Figure 4-6).
6. Referring to Figure 4-6, place one adjustable wrench on the adapter and the other adjustable wrench on Nut (B) and turn in opposite directions.

7. Remove and save the adapter.

4.3.7.3 Replacement Procedure

1. Combine the adapter and new Pigtail Cable by placing one adjustable wrench on the adapter and another adjustable wrench on Nut (B), shown in Figure 4-6 and turning in opposite directions until tight.
2. Insert Pigtail Cable through Remote's opening and the hex nut and washer.
3. Secure the Pigtail Cable by using 3/4" open end wrench or adjustable wrench to tighten nut and washer inside the Remote's enclosure.
4. If necessary, use an adjustable wrench to tighten Nut (A) shown in Figure 4-6.
5. Connect the Pigtail Cable's wires to J8 on the PCB. Refer to Table 4-2.
6. Follow the procedure for replacing the Remote's main PCB (Section 4.3.3.3).
7. Follow the procedure for closing the Remote's top and bottom enclosures (Section 4.3.1.3).

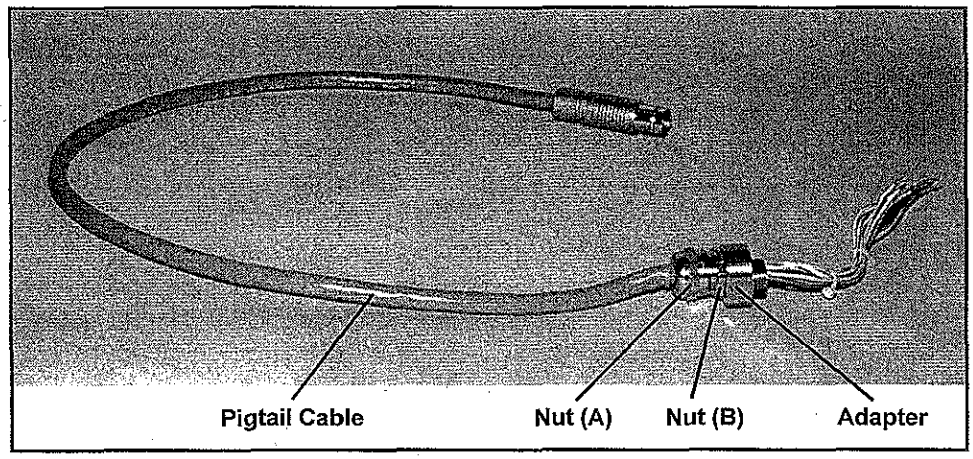

Figure 4-6: Remote Control's Pigtail Cable

4.4 EDA (applies to systems with catalog numbers 7805 and 7806)

⚠ WARNING

Lethal voltages are present. Before attempting disassembly you must power down the system and remove the AC/Mains power cord from the power source. Failure to comply may result in serious personal injury or death.

Electrostatic Sensitive Devices (ESD) are present. You must wear a wrist grounding strap and place components on an anti-static pad. Failure to comply may result in damage to equipment due to electrostatic discharge.

4.4.1 Removing EDA Pod Cover

Refer to Figure 4-7b.

4.4.1.1 Required Tools

- 5/64" balldriver or Allen wrench

4.4.1.2 Removal Procedure

1. Disconnect the Extravasation Clip Assembly from the EDA pod by rotating the connector and pulling.
2. Use the 5/64" balldriver to remove the single button screw on the bottom of the EDA pod cover.
3. Grab the EDA pod cover with both hands and carefully separate from Injector. There are wires connecting the pod cover to the EDA PCB.

⚠ WARNING

There is a five-wire harness running from the locking receptacle on the pod cover to the EDA PCB. Slowly remove the cover and leave enough room to insert your hand to disconnect the harness from the PCB. Failure to comply may result in equipment damage.

Do not hold the locking receptacle while removing the pod cover. Remove the cover squarely. Excessive up and down rocking will damage the retaining clips on the EDA pod cover.

4. Disconnect the J2 connector (EDA Locking Receptacle Assembly) from the EDA PCB.

4.4.1.3 Replacement Procedure

1. Connect the J2 connector (EDA Locking Receptacle Assembly) to the EDA PCB.
2. Line up the three (3) retaining clips on inside of the cover with the lugs on the EDA PCB and push.
3. Use the 5/64" balldriver to insert the button screw on bottom of the EDA pod cover.

4.4.2 Replacing EDA Locking Receptacle Assembly

Refer to Figure 4-7b.

4.4.2.1 Required Tools

- 11/16" open end wrench
- Small screwdriver

4.4.2.2 Removal Procedure

1. Follow the procedure for removing the EDA pod cover (Section 4.4.1.2).
2. Remove each of the EDA Locking Receptacle Assembly's five wires (see Table 4-3a or Table 4-3b) from the Methode connector. Insert a small screwdriver into each narrow slot exposing the pin spring. Push down on the spring and push the pin out.
3. Use the 11/16" open end wrench to loosen the nut inside the EDA pod cover.
4. Pull out the EDA Locking Receptacle Assembly.

4.4.2.3 Replacement Procedure

1. Insert the EDA Locking Receptacle Assembly through the hole in the EDA pod cover, wires first.
2. Use the 11/16" open end wrench to tighten the nut inside the EDA pod cover.
3. Insert the five wires into the Methode connector. If the EDA Locking Receptacle is colored gray, refer to Table 4-3a; if it is colored black, refer to Table 4-3b. When holding the Methode connector with the slots facing you, pin #1 is on the left side. Insert pins so that the springs are exposed in the connector slots.
4. Follow the procedure for replacing the EDA pod cover (Section 4.4.1.3).

EDA Locking Receptacle Assembly Methode Connector			
Pin No.	Color Code	Pin No.	Color Code
1	Yellow	5	Not Used
2	Black	6	Not Used
3	Red	7	Not Used
4	White	8	Brown

Table 4-3a (for gray locking receptacle)

EDA Locking Receptacle Assembly Methode Connector			
Pin No.	Color Code	Pin No.	Color Code
1	Red	5	Not Used
2	Black	6	Not Used
3	White	7	Not Used
4	Green	8	Brown

Table 4-3b (for black locking receptacle)

4.4.3 Replacing EDA PCB Harness

Refer to Figures 4-7a and 4-7b.

4.4.3.1 Required Tools

- 3/16" balldriver or Allen wrench
- wire cutters
- 3 replacement wire ties

4.4.3.2 Removal Procedure

1. Follow the procedure for removing the EDA pod cover (Section 4.4.1.2).
2. Disconnect the J1 connector (EDA PCB Harness) from the EDA PCB. Note the length of the service loop for replacement purposes.
3. Follow the procedure for removing the Injector's front enclosure (Section 4.2.1.2).
4. Disconnect the EDA PCB Harness connector from the Injector's main PCB.
5. Disconnect the 12-pin Molex connector.
6. Disconnect the Encoder Ribbon Connector by pulling the connector down from the bottom of the encoder located on the motor. **Note the orientation of the connector on the encoder.**
7. Use the 3/16" balldriver to remove the four (4) screws and locking washers that secure the motor's bracket to the baseplate. The baseplate is located inside the Injector's rear enclosure.
8. The motor bracket has two holes that fit over pins on the baseplate. Carefully lift the motor off the baseplate and tilt it. The timing belt will become loose. Remove the timing belt.
9. Allow the motor to rest inside the bottom of the Injector. The lashing tie secures the motor to the Injector's rear enclosure.
10. The EDA PCB Harness is secured to three (3) tie wrap pads inside the Injector. Cut the wire ties and remove the EDA PCB Harness. When cutting the wire ties, cut the top of the locking tabs to avoid accidentally cutting the wires.

4.4.3.3 Replacement Procedure

1. Insert the EDA PCB Harness. Either end may be connected to either PCB. Allow the harness to extend approximately three (3) inches into the EDA area.
2. Secure the EDA PCB Harness with wire ties to the three (3) tie wrap pads inside the Injector. Before tightening the wire ties, ensure that there is sufficient slack to allow the EDA PCB Harness connectors to mate with the receptacles on the EDA PCB and the Injector's main PCB.
3. Hold the motor with one hand while replacing the timing belt.
4. Fit the motor bracket onto the baseplate making sure that the baseplate's pins are engaged.
5. While still holding the motor with one hand, insert the first screw with locking washer to secure the motor bracket to the baseplate. Tighten firmly with the 3/16" balldriver.
6. Insert the remaining three (3) screws with locking washers and tighten with the 3/16" balldriver.
7. Connect the 12-pin Molex connector. A snap will be heard when the proper connection is made.
8. Connect the EDA Harness connector to the Injector's main PCB.
9. Connect the Encoder Ribbon Connector to the bottom of the encoder. Note the number "1" on the connector. It must be positioned toward the inside of the Injector.

⚠ WARNING

Do not reverse the connector on the encoder. This may damage the encoder.

10. Connect the J1 connector (EDA PCB Harness) to the EDA PCB.
11. Follow the procedure for replacing the Injector's front enclosure (Section 4.2.1.3).
12. Follow the procedure for replacing the EDA Pod Cover (Section 4.4.1.3).

4.4.4 Replacing EDA PCB

Refer to Figures 4-7a and 4-7b.

4.4.4.1 Required Tools

- 1/4" nut driver
- 5/64" balldriver or Allen wrench
- Medium size flat blade screwdriver

4.4.4.2 Removal Procedure

1. Follow the procedure for removing the EDA pod cover (Section 4.4.1.2).
2. Disconnect the EDA PCB Harness Connector (J1) from the EDA PCB.
3. Use 1/4" nut driver to the three (3) standoffs with self-locking pod catches.
4. Use the flat blade screwdriver to remove nylon screw and washer.

5. Use 5/64" balldriver to remove the single button screw.
6. Carefully remove the EDA PCB. There is a nylon spacer behind the PCB that aligns with the nylon screw.

4.4.4.3 Replacement Procedure

1. Position the nylon spacer to align with the nylon screw.
2. Position the new EDA PCB and secure with the three (3) standoffs with self-locking pod catches. Tighten by hand only.
3. Use the 5/64" balldriver to insert the button screw.
4. Use the flat blade screwdriver to insert the nylon screw and washer.
5. Use the 1/4" nut driver to tighten the three standoffs.
6. Connect the EDA PCB Harness Connector (J1) to the EDA PCB.
7. Follow the procedure for replacing the EDA pod cover (Section 4.4.1.3).

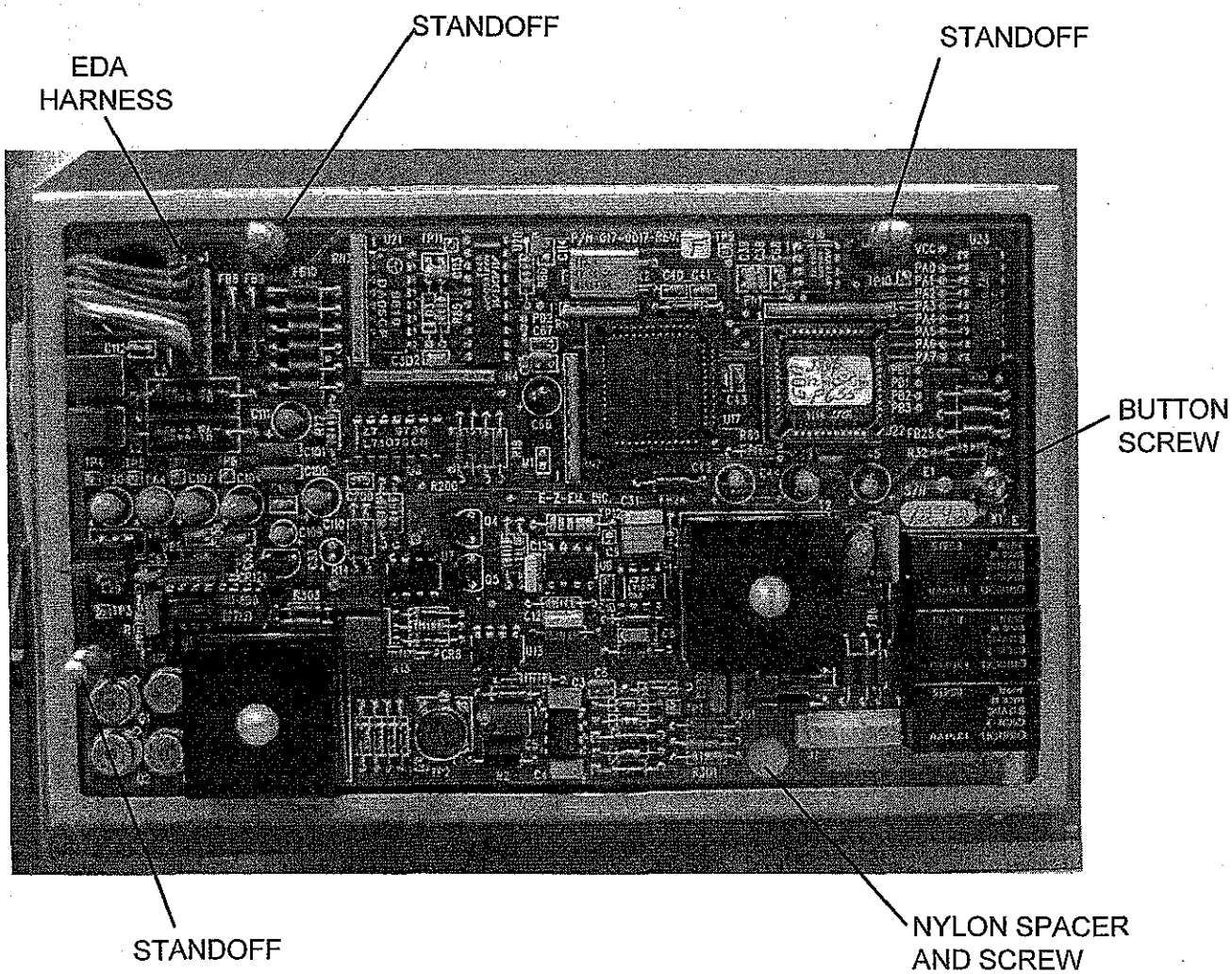

Figure 4-7a: EDA PCB

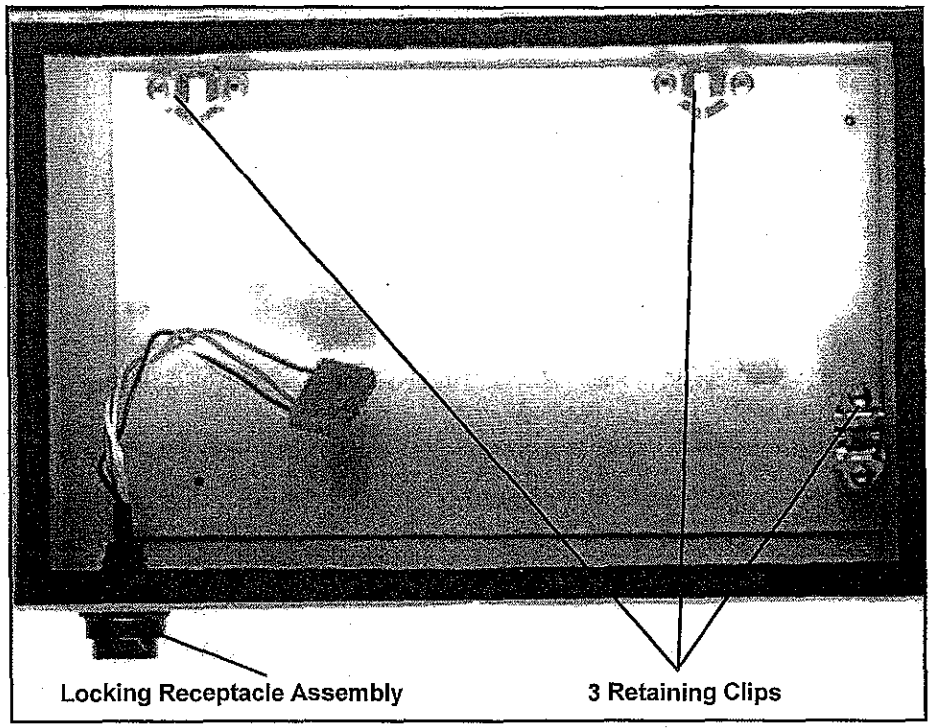

Figure 4-7b: Inside EDA Pod Cover

4.5 MAINTENANCE MODE

⚠ WARNING

Changing the Table Pointer in Maintenance Mode affects the pressure limit at which the Injector declares an overpressure condition. Before attempting to enter Mainetance Mode make sure that you throughly undertsand the instrcutions prescribed in this section before proceeding.

4.5.1 General

On latter revisions of the Percupump Touchscreen CT Injector, a provision to adjust the pressure at which the injector declares an overpressure condition was incorporated into the design. Changing a Table Pointer in Maintenance Mode facilitates this. By changing the value of the Table Pointer, the pressure at which the Injector declares an overpressure condition can be raised or lowered. This pointer is used to compensate for mechanical differences between injectors and to optimize overpressure performance within its specified range. At the time of manufacture,Injectors are manufactured tofall within the following overpressure range:

Injector Flow Rate (ml/sec)	Overpressure Detect Range(psi/KPa)
0.25-0.30	40/276-120/828
0.40-0.90	40/276-200/1380
1.00-1.90	85/586-300/2071
2.00-2.90	175/1280-300/2071
3.00-3.90	225/1553-300/2071
4.00-5.00	250/1725-300/2071

The Table Pointer is stored in a non-volatile memory location in the Injector head. Accessing and changing the Table Pointer stored in the Injector head is performed by using the Maintenance Mode menu on the Remote Control.

The value of the Table Pointer is set at the factory at the time of manufacture and final test. Under normal circumstances it should never require changing. However, for a service effort that requires replacement of the Main PCB or motor in the Injector head, the Injector overpressure limits must be checked, and if necessary, the table pointer changed to optimize performance.

To check the overpressure performance of an injector after such a repair effort, follow these steps:

i) Complete the intended repair effort to the Injector head (main PCB or motor replacement).
ii) Connect it to a remote control and Power. Make sure that is successfully completes its power up diagnostics.
iii) Place a syringe into the injector, initialize and fill with water.

iv) Directly connect a pressure gauge and needle valve in series to the distal end of the syringe. Do not install a small-bore extension tube between the syringe and the gauge / needle valve. Orient the needle valve furthermost downstream such that the needle valve can be used to regulate the pressure in the syringe, and the pressure gauge monitors it.

v) Perform a series of injections at flow rates of 0.25 cc/sec, 1.0 cc/sec, 2.5 cc/sec and 5.0 cc/sec.

vi) During each injection gradually close down the needle valve and monitor the pressure rise in the syringe using the pressure gauge. If the pressure exceeds 350-400 psi without the Injector declaring an overpressure condition discontinue the test and proceed to the following sections to lower the Table Pointer.

vii) For each injection note the pressure at which the Injector declare an overpressure condition.

viii) Compare these values to the ranges specified in the above table.

ix) If they fall within the specified ranges, the repair effort is complete. If they are either too high, or too low, carefully read the following sections to enter Maintenance Mode, change the Table Pointer and save it.

x) After changing the table pointer, repeat the measurements made in steps v through ix.

xi) Iterate as required until the Injector's overpressure performance falls within specification. Do not adjust the system such that the Injector's overpressure performance is above specified ranges.

4.5.2 Entering Maintenance Mode

Maintenance Mode is entered by first powering up the Injector system and letting it complete its diagnostics. Once the STOP mode menu on the Remote control is displayed, press the "Set-Up" soft key on the Remote's membrane panel. The Remote's display should then appear as that shown in Figure 4-8. Using the letter soft keys on the left side of the display, type in the password, "Maintm". After entering the password, press the unused, "Hidden" soft key as shown in figure 4-8.

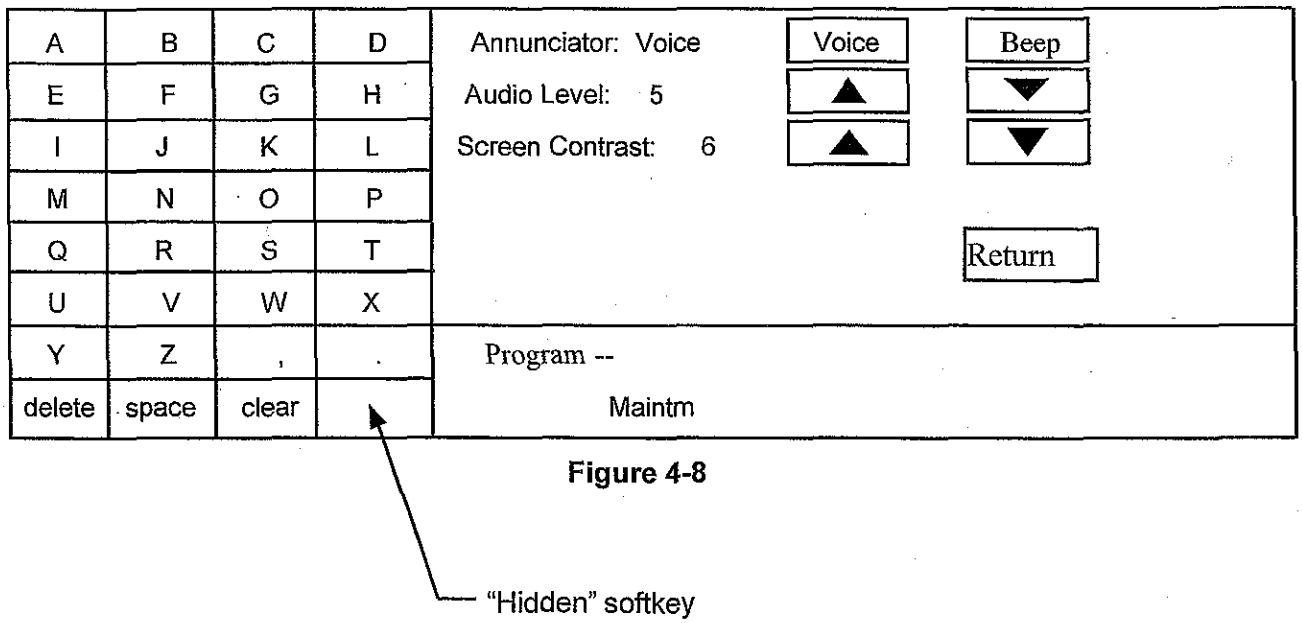

Figure 4-8

After the "Hidden soft key is pressed, the Remote's display should appear as that shown in Figure 4-9. On the right side of the display is a single parameter entitled "Table Pointer". To the right of this label is the current value of the table pointer. Adjacent to these labels are Up and Down arrow soft keys that are used to raise and lower the table pointer value. Permissible values for the Table Pointer range from 0 to 9 in increments of 1. Lowering the value of the table pointer will decrease the pressure at which the Injector declares an over-pressure. Raising the value of the Table Pointer will increase the pressure at which the Injector declares and overpressure.

4.5.3 Exiting Maintenance Mode and Saving the Table Pointer

After the Table Pointer is changed to the desired value, saving it and exiting Maintenance Mode is performed by the following key press sequence.

i) First press and hold the dedicated "STOP" membrane panel button below the display.
ii) While holding the "STOP", simultaneously press the "Return" soft key on the display.

The system should then exit Maintenance Mode. At the conclusion, a two-second audible acknowledgement tone will be broadcast by the Remote control. The display will then revert to its STOP mode menu. Note: The two-second audible tone will only be broadcast when the value of the Table Pointer is changed.

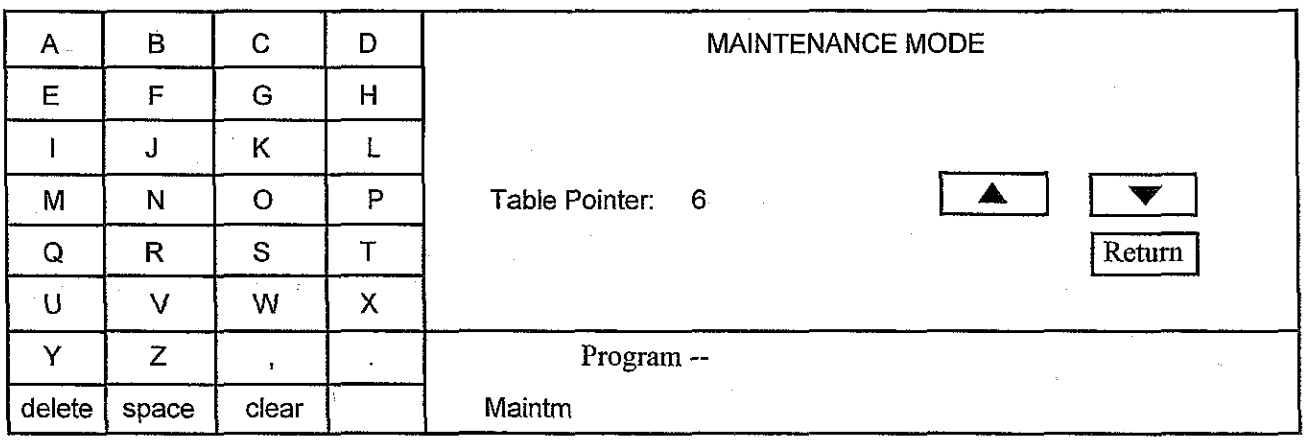

Figure 4-9

Appendix A

Parts List

A.1 INJECTOR HEAD

Injector Head Replacement Parts	
Part	**E-Z-EM Item No.**
DC Gear Motor Encoder	1470817 1470798
Belt, Timing	1470304
Assembly, Injector Main PCB Microcontroller Microcontroller and Programmable EPROM Programmable EPROM	1471319 1471114 1470815 1470800
Insulator, Regulator	1470420
Nylon Screw, Regulator	1479100
Assembly, Ribbon Cable, Front Panel	1471064
Lashing Tie, Motor	1470535
Assembly, Cable, CE Pump Pigtail	1471166
Assembly, Hall Effect Sensor, Syringe Door	1471137
Set Screw, Hall Effect Sensor	1479034
Set Screw, Ball Screw Hard Stop	1479034
Heater, Fast-Load	1471201
Assembly, Receptacle Heater	1471221
Assembly, Power Supply	1471217

Table A-1 (Continued)

Assembly, Injector Front Panel PCB Front Panel Membrane	1470823 1470920
Gasket, Front Panel Membrane	1470730
Assembly, Injector Pendant Connection	1471059
Gasket, Pendant Connection	1471112
Assembly, Audio Annunciator	1471110
Gasket, Audio Annunciator	1474233
Rocker Switch, Power	1470171

Table A-1

A.2 REMOTE CONTROL

Remote Control Replacement Parts	
Part	**E-Z-EM Item No.**
Assembly, Remote PCB Microcontroller EPROM	1471306 1474024 1470800
Touchscreen, Front Panel Remote	1470813
Speaker, Remote	1470871
Display Controller, LCD	1470930
Assembly, Cable, CE Remote Pigtail	1471168
Adaptor, Connector	1471163
Washer, 5/8 INT, Low Profile, Star	1471169
Panel Nut, 5/-24	1471170
Display, LCD, 640x200	1474001
Assembly, Printer Connection	1471060
Assembly, Pendant Connection	1471073
Assembly, Pendant/X-Ray Connection	1471073

Table A-2

A.3 EXTRAVASATION DETECTION ACCESSORY

Extravasation Detection Accessory Replacement Parts	
Part	**E-Z-EM Item No.**
Assembly, EDA PCB Microcontroller Waferscale	1471341 1474024 1475400
Locking Receptacle Assembly	1471230
Methode Connector, 8 Pin	1471229
Ball Stud Fastner (12 Lb)	1471314
Ball Stud Fastner (22 Lb)	1471323
EDA PCB Harness	1471231
EDA Clip Assy, Pkgd (E-Z-EM Catalog No. 7870)	N/A

Table A-3

A.4 CABLES

Cable Replacement Parts	
Part	**E-Z-EM Item No.**
Power Cord, Hospital Grade, US	1470899
Assembly, 50' Remote Cable (E-Z-EM Catalog No. 7855)	1471167
Assembly, Pendant Switch	1471000
Power Cord Assy, British	1471346
Power Cord Assy, Continental Europe	1471347

Table A-4

A.5 PRINTERS

Printer	E-Z-EM Catalog No.
120 V Thermal Printer With Cables	5869
220 V Thermal Printer With Cables	5868

Table A-5

A.6 CONSUMABLES

Consumable	E-Z-EM Catalog No.
Fast-Load Syringe	6720
Extravasation Accessory Electrode Patch	7880

Table A-6

Appendix B

Schematics and Printed Circuit Board Drawings

PLEASE CONSULT E-Z-EM CUSTOMER SERVICE FOR LATEST REVISIONS OF SCHEMATICS AND ASSEMBLIES

B.1 ELECTRICAL SCHEMATICS

Dwg. No. 016-0151, Rev. C	Injector Head
Dwg. No. 016-0152, Rev. E	Remote Control
Dwg. No. 017-0007, Rev. F	EDA PCB

B.2 PRINTED CIRCUIT BOARD AND ELECTRICAL ASSEMBLY DRAWINGS

Dwg. No. 016-0038, Rev. H	Injector Head Main PCB
Dwg. No. 016-0053, Rev. F	Injector Head Front Panel PCB
Dwg. No. 016-0242, Rev. A	Power Supply Assembly
Dwg. No. 017-0040, Rev. D	Remote Control Main PCB
Dwg. No. 017-0017, Rev. J	EDA PCB Assembly